

What is claimed is:

1. An optical displacement-measuring apparatus, comprising a scale on which optical gratings formed along a first axis and a second axis crossing said first axis, and a sensor head arranged opposite to said scale and relatively movable along said first and second axes, said sensor head including a photosensitive unit for optically detecting a relative movement to provide a displacement signal, wherein said photosensitive unit comprises:

a substrate; and

a first and second photosensitive device arrays formed with a semiconductor film deposited on said substrate and arrayed along said first and second axes at a certain pitch to providing displacement signals corresponding to the displacement along said first and second axes, respectively.

2. The optical displacement-measuring apparatus according to claim 1, wherein said substrate comprises a transparent substrate having a front surface on which said first and second photosensitive arrays are formed and the reverse surface serving as a light incident surface.

3. The optical displacement-measuring apparatus according to claim 2, wherein said substrate comprises a flexible resinous substrate.

4. The optical displacement-measuring apparatus according to claim 1, wherein said sensor head has an electroluminescence device serving as a light source that illuminates said scale.

5. An optical displacement-measuring apparatus, comprising a scale on which optical gratings formed along a first axis and a second axis crossing said first axis, and a sensor head arranged opposite to said scale and relatively movable along said first and second axes, said sensor head including a photosensitive unit for optically detecting a relative movement to provide a displacement signal, wherein said photosensitive unit comprises:

a substrate;

a first photosensitive device array formed with a first semiconductor film deposited on said substrate and arrayed along said first axis at a certain pitch for providing a displacement signal corresponding to a displacement along said first axis;

an insulator layer covering said first photosensitive device array; and

a second photosensitive device array formed with a second semiconductor film deposited on said insulator layer and arrayed along said second axis at a certain pitch for providing a displacement signal corresponding to a displacement along said second axis.

6. The optical displacement-measuring apparatus according to claim 5, wherein said substrate comprises transparent substrate having a front surface on which said first and second photosensitive arrays are stacked and the reverse surface serving as a light incident surface.

7. The optical displacement-measuring apparatus

according to claim 6, wherein said substrate comprises a flexible resinous substrate.

8. The optical displacement-measuring apparatus according to claim 5, wherein said sensor head has an electroluminescence device serving as a light source that illuminates said scale.

9. An optical displacement-measuring apparatus, comprising a scale on which optical gratings are formed, and a sensor head arranged opposite and relatively movable to said scale, said sensor head including a photosensitive unit for optically detecting a relative movement to provide a displacement signal, said photosensitive unit including a substrate, and a photosensitive device array formed with a semiconductor film deposited on said substrate and patterned, wherein

at least one of said scale and said photosensitive unit is formed using a flexible resinous substrate.

10. The optical displacement-measuring apparatus according to claim 9, wherein said photosensitive unit comprises:

a flexible resinous substrate; and

a photosensitive device array consisting of a plurality of photosensitive devices formed with a semiconductor film deposited on said flexible resinous substrate to provide displacement signals with different phases.

11. The optical displacement-measuring apparatus

according to claim 9, wherein said scale is a flat scale having one-dimensional optical gratings formed thereon.

12. The optical displacement-measuring apparatus according to claim 9, wherein said scale is a flat scale having two-dimensional optical gratings formed thereon.

13. The optical displacement-measuring apparatus according to claim 9, wherein said scale is a cylindrical scale having one-dimensional optical gratings formed thereon.

14. The optical displacement-measuring apparatus according to claim 9, wherein said scale is a cylindrical scale having two-dimensional optical gratings formed thereon.

15. The optical displacement-measuring apparatus according to claim 9, wherein said scale is a spherical scale having two-dimensional optical gratings formed thereon.

16. The optical displacement-measuring apparatus according to claim 9, wherein said scale is a free curved scale having two-dimensional optical gratings formed thereon.

17. The optical displacement-measuring apparatus according to claim 9, wherein said scale has two-dimensional optical gratings and said photosensitive unit including first and second photosensitive device arrays formed at different locations on said substrate corresponding to said two-dimensional optical gratings.

18. The optical displacement-measuring apparatus according to claim 9, wherein said scale has two-dimensional optical gratings and said photosensitive unit including first and second photosensitive device arrays stacked at the same

location on said substrate sandwiching an insulator layer therebetween corresponding to said two-dimensional optical gratings.

19. The optical displacement-measuring apparatus according to claim 9, wherein said sensor head has an electroluminescence device serving as a light source that illuminates said scale.